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Scours in Sheep and Goats in Oregon

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SUMMARY

1. Scours in sheep and goats is an important problem in Oregon.
2. It is usually the result of infestation with worms.
3. Either a microscopic examination of droppings or an autopsy is necessary for a diagnosis.
4. Many owners wait too long before calling a veterinarian and getting a diagnosis.
5. The most serious of the worms which cause scours in Oregon can be killed through proper treatment.
6. Control of losses from scours is both practicable and economical.

Scours in Sheep and Goats in Oregon

By
J. N. Shaw

INTRODUCTION

After meeting with sheep men and goat men throughout Oregon it seems to the writer that the question most often asked of him is, "What can I do for scours in my sheep?" or "What can I do for scours in my goats?" As the number of these animals in Western Oregon has increased, these questions have become all too frequent. It is quite true that scours or diarrhea is only a symptom, but it is such a common one that it is being used as a title for this circular.

Every serious outbreak of scours in sheep and goats which has been observed by the department of Veterinary Medicine of the Oregon Agricultural Experiment Station has been caused by parasites of some type. In dealing with scours this circular will consider only those cases produced by worms or parasites.

CAUSES

There are found in the digestive organs of sheep and goats in Oregon a large number of different kinds of worms. At least five groups of these seem to cause scours. Four of these groups are threadworms, while the fifth is a flatworm. Because it produces somewhat different symptoms and is found in a different part of the body, this flatworm will be considered separately.

THREADWORMS

The following is a brief description of each of the four groups of threadworms of the digestive system which seem definitely associated with scours in Oregon sheep and goats.

Small stomach-worms (*Ostertagia ostertagi, Ostertagia circumcincta*), are very common but are so small they are readily overlooked. They vary from one-fourth to one-half inch in length and are as small as an ordinary hair. If filled with blood they appear as fine, dark hairs. If not engorged with blood they have the appearance of wet wool. They may be seen hanging from the point of a knife if it be scraped gently over the lining of a stomach containing these worms. If some of the content of such a stomach be scraped from the lining and placed in a glass of water the worms may appear as very fine threads moving rather actively.

The fourth stomach is the only one in which these worms occur. This stomach is that part from which the intestine extends. It lies chiefly on the lower right side, and is quite small in the lamb or kid.

These worms multiply by laying eggs which pass out in the dung. Such eggs have been hatched in as short a time as 12 hours if conditions

were favorable; and the young have been kept alive in ordinary tap water for three months. During this period they molted or changed their skins several times.

Fig. 1. Small stomach-worm (*magnified 4 times*).

These stomach worms should not be confused with the common stomach worm (*Haemonchus contortus*) which is very prevalent in some sections of the United States. This latter worm has not been found in Oregon except in one sheep which was shipped in.

Intestinal worms (*Trichostrongylus vitrinus, Trichostrongylus extenuatus, Trichostrongylus instabilis, Trichostrongylus colubriformis,* and *Nematodirus filicollis*) also are very common. The first four of these are even smaller than the small stomach-worms, averaging about a quarter of an inch in length. It is almost impossible to see them with the naked eye unless they are suspended in water and held up to the light. They live in the upper part of the small intestine near the fourth stomach. Sometimes some of these are found in large numbers in the fourth stomach.

The method of multiplication is very similar to that of the small stomach-worm. With one exception the eggs are about the same size and shape, and they hatch at about the same time.

Hookworms (*Bunostomum trigonocephalum*) have been found quite prevalent in a few bands of Oregon sheep. They are from one-half to one inch long and as large as a coarse sewing thread. They inhabit the lower portion of the small intestine. The method of multiplication is very similar to that of the stomach-worm.

Worms of the large intestine (*Chabertia ovina, Oesophagostomum venulosum, Trichuris ovis*) are usually present in sheep and goats of Western Oregon. The different types of these worms vary in length from one-half to two or three inches and are as large as a coarse sewing thread. The first-

Fig. 2. Small intestinal worm (*magnified 3 times*).

named of these is usually considered harmless but both sheep and goats have been observed which had severe inflammation of that portion of the large intestines in which these worms were most numerous. This worm is the one most frequently found by owners of sheep and goats when they autopsy their animals.

These worms multiply in a similar manner to the small stomach-worms.

SYMPTOMS

Usually the first symptom of infestation with threadworms is loss of flesh. Regardless of the type of feed, infested lambs and kids fail to make the proper growth. As the loss of flesh progresses the bowels are disturbed and scours usually appear. In some instances mature sheep do not develop scours until a day or two before death occurs. In most affected bands several animals will show symptoms at about the same time.

After scours becomes severe a swelling, which is variously known as water ball, wattle, or bottle jaw, may appear under the jaw.

The affected animals may die within a week or ten days after the appearance of scours or they may live for several weeks. The appetite usually remains good until a day or two before death occurs. If infestation

is not too severe and the animals are well fed, some may gradually recover. Under average conditions, however, more than half those which develop scours die unless they are treated.

While losses from threadworms may take place at any season, most outbreaks of the trouble appear after the first fall rains and continue until spring.

DIAGNOSIS

Too much emphasis can not be placed on a correct diagnosis. There are two methods of making such diagnoses. One is by a microscopic examination of the dung, and the other is by an autopsy of a freshly killed affected animal.

Microscopic examination of the dung can be made by veterinarians without destroying the animals. If enough mature worms are present to cause very much trouble there will be large numbers of eggs in the dung. These are usually not difficult to find with the aid of a microscope. But unfortunately the eggs of several types of worms are very similar. Consequently it is sometimes impossible to determine from such microscopic studies just which worms are present.

Autopsy of a freshly killed affected animal affords the most satisfactory method of diagnosis. In some cases a lot of jellylike substance is present around the stomach and intestines. The walls of these organs may be thickened. If stomach-worms are causing the trouble there may be reddened areas on that part of the lining of the fourth stomach which is near the opening into the small intestine. Small nodules not much larger than the head of an ordinary pin may be located on this lining. Young stomach-worms develop in such nodules. Even though large numbers of stomach-worms are present they are easily overlooked unless some of the stomach content is scraped off the lining and shaken up in water.

If the small worms of the small intestine are causing scours, the lining of the upper part of this intestine will usually be markedly inflamed. These worms are so small it is difficult to see them even when they are suspended in water. For this reason sheep owners are often skeptical of their presence, even when a microscope reveals ten to twenty in a single drop of intestinal content.

Hookworms are usually accompanied by pinhead-sized red spots on the lining of the lower portion of the small intestine. These parasites are dark in color when filled with blood and are large enough to be seen rather easily.

With one exception the worms of the large intestine are about the size of hookworms. In some animals in which these worms are very numerous the large bowel may be badly inflamed.

Since the majority of animals showing symptoms are infested with several species of worms, it is usually necessary for the veterinarian who performs the autopsy to make a thorough examination before he can determine just which ones are causing the trouble.

TREATMENT

In considering treatment it should be borne in mind that every remedy which will destroy worms is more or less poisonous. It is inadvisable, therefore, to use worm remedies unless there is reasonable assurance that worms are present. Owners should realize too that sheep and goats which are very thin and weak are often unprofitable animals even if all worms are destroyed. The best results are obtained when treatment is given at the time of first appearance of symptoms rather than after considerable death losses have occurred.

Copper sulfate or bluestone has long been recommended for use against the common stomach-worm, but this worm evidently is not causing any serious damage in Oregon. Bluestone has not proved a satisfactory remedy for any of the worms commonly found in Oregon sheep and goats. The small stomach-worms have lived for three hours in a 1-percent solution of this chemical. This is the strength usually recommended for the common stomach-worm. Furthermore, bad results have frequently been reported following the careless administration of bluestone. Animals which are very weak seem especially apt to suffer from its use.

Lugol's solution of iodine and **nicotine sulfate** are among the other remedies which have been used for common stomach-worms. Both these have proved disappointing as treatments for sheep and goats affected with the types of stomach and intestinal parasites found in Oregon.

Tetrachlorethylene is a new treatment which has proved quite successful in destroying the small stomach-worms and the small worms of the small intestine. Experiments at this Station have shown that a single dose may cut down the number of eggs in a sheep's dung 20 times. This drug is only slightly poisonous, but bad results have been reported occasionally following its use in animals in very poor condition. It is not expensive. It is put up in various-sized soft gelatine capsules. The dose usually recommended for a mature sheep or goat is 5 c.c. These capsules can be obtained from most of the veterinarians and a good many of the drug stores.

Some owners of sheep and goats have reported that two and in some cases three treatments with tetrachlorethylene were necessary to get desirable results.

Experimental evidence of the efficiency of tetrachlorethylene against hookworms and worms of the large intestine has not been obtained but field trials indicate good results.

CONTROL AND ERADICATION

Examinations of winter lambs less than two months old have shown that threadworm infestation may take place in Western Oregon even in the winter. Infested sheep and goats pass eggs at all seasons, too. It is known that the embryos of the various threadworms will live several months. Any successful control measures must be based upon these facts.

Two methods of control are possible. One is to prevent the contamination of pastures, corrals, yards, and barns with the droppings of sheep and goats containing these worm eggs. This is done through treatment of

the animals at regular intervals. The other method is to prevent any susceptible sheep or goat from becoming infested through using any infested pastures, corrals, and barns. On many ranches the most practicable control method is a combination of these two. In bands which are badly infested the tetrachlorethylene treatment should be repeated every week until three or four doses have been given. After this it is usually necessary to treat only those animals which show symptoms. Sheep and goats not showing symptoms but running on infested pastures should be treated at least twice each fall—first about the time of the first fall rains, and second about a month later. If possible, some temporary pasture or cultivated ground should be provided, especially for lambs and kids. Pastures which are badly infested may be either plowed up or used for other livestock than sheep and goats. The manure from the sheep and goat corrals should not be used on cultivated land which is to be grazed by these animals.

FLATWORMS

Liver-flukes (*Fasciola hepatica*) are frequently spoken of as leeches. They are flat worms shaped somewhat like a cherry leaf. They average about two-thirds of an inch long and about half that wide. They are of a somewhat brownish color. The mature flukes are found in the gall bladders and the bile ducts of the livers of infested animals.

Their life-histories are very complex. Each fluke contains both male and female organs, and consequently is capable of laying eggs. It has been claimed that a single fluke can produce up to 50,000 eggs. These eggs pass into the intestine along with the bile and then escape from the bowels with the dung.

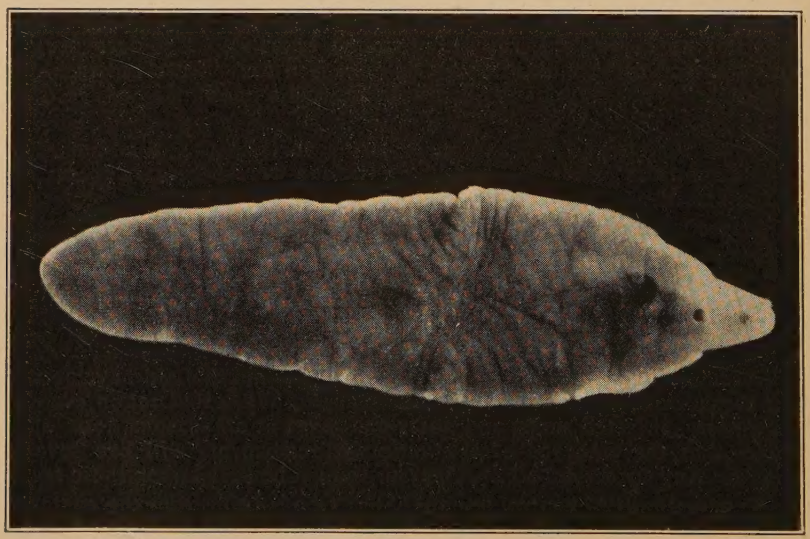

Fig. 3. Liver-fluke or leech (*magnified 3 times*).

Eggs which are kept in water may hatch in from two to sixteen weeks or possibly even longer. The young embryos, upon escaping from the eggs, swim very rapidly. They die in a few hours unless they find a suitable snail to attack. In Oregon the only snail (*Galba bulimoides*) so far found to be attacked by these embryos is a small one up to one-third of an inch long, which lives in sluggish streams, small bodies of still water, and

Fig. 4. Fluke eggs as passed with droppings (*magnified 70 times*).

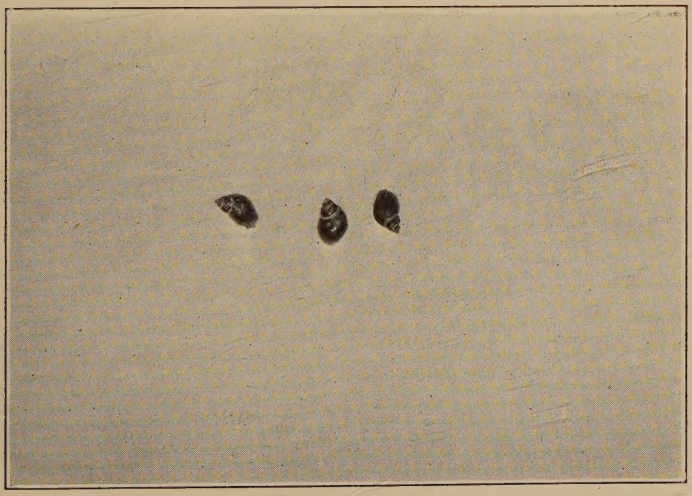

Fig. 5. Snails in which fluke spends part of life (*natural size*).

Fig. 6. Forms of fluke occurring in snail. One in center has lost its tail and is ready to infest sheep.

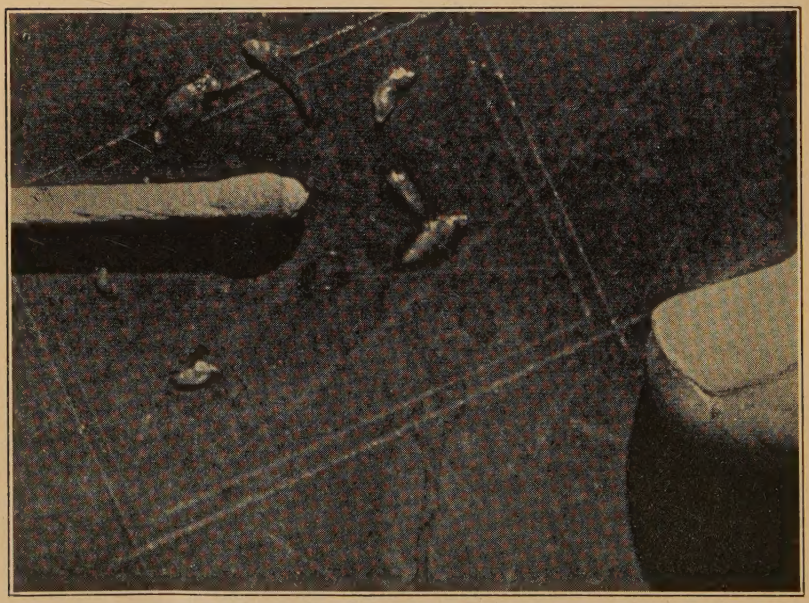

Fig. 7. Young fluke taken from liver tissue compared with match head. Taken from lamb five months old.

damp, marshy places. After entering a suitable snail the young fluke changes its form several times before it comes out. During these changes there is a multiplication of the fluke. Thus one embryo entering a snail may result in a thousand young flukes leaving it. The young flukes have long tails when they emerge from the snail. They swim very vigorously for a short time. In a few hours, however, the tails are lost and the parasites encyst on some convenient object such as a grass leaf. These cysts are so small they can scarcely be seen with the naked eye. When they are

Fig. 8. "Pot belly" caused by immature flukes, three-year-old ewe.

taken in with food or water the flukes escape, burrow through the intestinal wall, crawl around in the abdominal cavity until they reach the liver, and then pass into this organ by penetrating the capsule. They wander around in the liver tissue for five or six weeks, gradually increasing in size. As they approach maturity they pass into the bile ducts, where they remain for several months, producing large numbers of eggs.

Guinea pigs and rabbits, as well as sheep, have been experimentally infested by feeding them with material from snails from fluke-infested pastures.

SYMPTOMS

At least three groups of symptoms are associated with fluke infestation in sheep and goats. These appear successively at the various stages of the life of the fluke.

In some districts sheep may die very suddenly at the time when young flukes are passing into the liver. Such losses are frequently among the

fattest sheep in the band. In most instances the owners do not see any indications of trouble until the dead animals are found. Losses do not seem directly related to the number of flukes which are penetrating the liver as some cases have been observed in which only a few flukes were present. This type of fluke trouble has been seen in Oregon in the spring, summer, and fall.

Similar deaths occurring in Australia and New Zealand have apparently been shown to be the result of bacterial infection which takes place in

Fig. 9. Wattle under jaw caused by immature and mature flukes, also by stomach-worms and intestinal worms.

the areas of the liver injured by the flukes. If the bacteria which cause the trouble are not present large numbers of young flukes may penetrate the liver without causing these sudden deaths.

As soon as the young flukes enter the liver they burrow through the tissue of this organ, thus producing considerable damage. If a heavy infestation of flukes takes place a large amount of damage is done. This interferes with the normal functions of the liver to such an extent that rather typical symptoms are produced. In such cases there is a rapid loss of flesh, pale membranes of the eyes and mouth, development of "pot belly" or a large abdomen, shortness of wind, and, in many instances, a soft swelling under the jaw which is called a wattle, bottle jaw, or water ball. There is no diarrhea at this stage. If the liver is injured too severely these symptoms may become more and more marked until death finally occurs. These symptoms are seen in either the summer or fall months.

The third group of symptoms are caused by mature flukes. After they pass from the liver tissue into the bile ducts and gall-bladder the injured

liver tissue recovers. When this occurs the "pot bellies" tend to become smaller. But the infested animals continue to show lack of thrift, pale membranes, and an occasional wattle. Diarrhea may appear at this stage, although it is not a constant symptom, even in sheep which are heavily infested.

Animals showing only slight symptoms may live until the flukes pass out of their livers. Those showing severe symptoms usually die unless treatment is given. This type of trouble manifests itself most often in late fall, winter, or early spring.

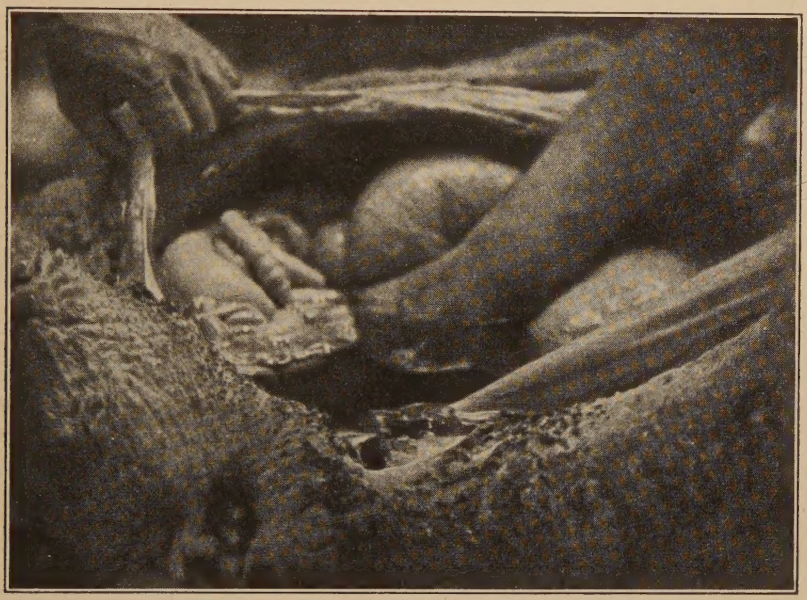

Fig. 10. Fluid in abdomen caused by immature flukes.

DIAGNOSIS

The history of the trouble will often help in making a diagnosis. In most affected bands a fairly high percentage of the animals show symptoms. It is not unusual to find sheep in the same band showing the various symptoms that have been described. This occurs because flukes are in various stages of development.

If mature flukes are causing symptoms a diagnosis can be made by finding fluke eggs in the droppings of the infested sheep. But if immature flukes are producing trouble an autopsy is the only satisfactory method of diagnosis.

In animals which have died suddenly the very small flukes may be found just penetrating the livers. There is usually a mass of dead liver tissue at the point of penetration. These masses have a dull, cooked appearance. There may be some blood-colored fluid in the abdomen. Hemorrhagic spots may be found on the heart, intestines, or in the muscles.

These spots have caused some of these cases to be called hemorrhagic septicemia.

Autopsies of sheep or goats which have the young flukes in the liver tissue will usually reveal a liver with a rough, uneven surface of a grayish color. The abdomen will usually contain a considerable amount of straw-colored or slightly bloody liquid. As much as five gallons has been found in a sheep. In these cases the young flukes can be found in the livers by cutting through these organs and pressing upon the tissue near the cut surface. This will force the flukes out of their channels on to the cut surface.

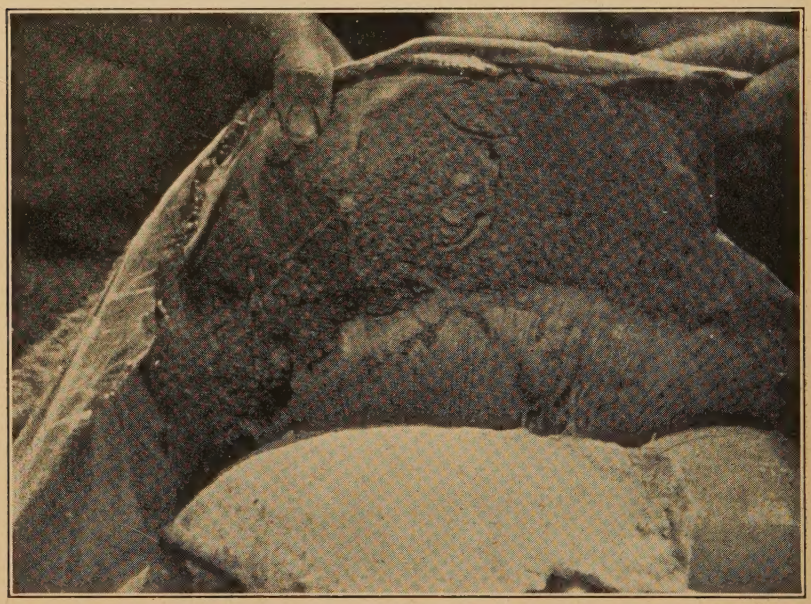

Fig. 11. Diaphragm and liver showing roughened surfaces caused by penetration of flukes.

Autopsies of animals infested with mature flukes usually show the bile ducts very considerably enlarged. Upon opening these ducts the flukes are found in them. If the worms are very numerous the bile ducts will be very much enlarged, thickened, and somewhat gritty when they are cut. It is not unusual to find both immature and mature flukes in the same liver.

TREATMENT

Carbon tetrachloride in 1-c.c. doses has proved to be a very satisfactory remedy for the destruction of mature flukes. This dose will not destroy the immature worms. Dr. Montgomerie of Wales has found that 5-c.c. doses will destroy immature flukes that are beyond five weeks old. Carbon tetrachloride is poisonous under some conditions and consequently should not be given unless there is evidence of fluke infestation. Soft gelatin capsules containing the proper dose can be obtained from either the practising veterinarians or the drug stores.

In order to obtain the best results, treatment should be given as soon as possible after the flukes reach maturity. Many owners have waited until death losses were heavy and most of the remaining animals were very thin and weak before calling a veterinarian and getting a correct diagnosis. Even though death losses in such infested animals are stopped, the financial loss is still very serious because of both loss of weight and loss of lambs dropped by thin fluke-infested ewes.

It is good insurance to have dung from a few animals of any band suspected of being infested with liver flukes examined in the early fall. This will allow the infested bands to be diagnosed and treated before the winter season, when the most serious losses usually occur.

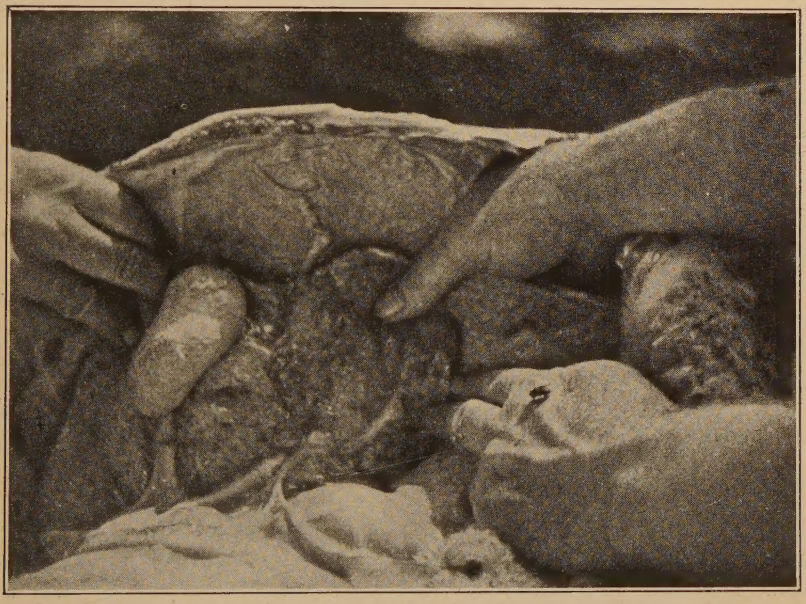

Fig. 12. Under-surface of liver showing small bile ducts and rough, discolored liver surface caused by immature flukes.

CONTROL AND ERADICATION

There are three possible methods of control and eradication of flukes on a ranch. These are (1) the treatment of all fluke-infested animals at regular intervals in order to prevent infestation of pastures with fluke eggs, (2) the destruction of all snails which act as secondary hosts for liver flukes, and (3) the fencing of all snail-infested areas so that sheep, cattle, and goats can not pasture on them.

Studies at this Station have shown that mature flukes may be found in Western Oregon sheep and goats every month in the year and that immature flukes may be found in them from June until February. These facts prove the danger of pasture infestation at any time unless treatment is given regularly to fluke-infested animals. The cost of carbon tetrachloride is so low that repeated treatments can be given economically. Studies

already made indicate that the interval of time between treatments should be not more than three to four weeks.

Destruction of snails may be accomplished in two ways. One is through draining all marshy lands so that the snails will not find satisfactory living conditions. This is impracticable on most of the fluke-infested farms of Western Oregon. The other is through the use of copper sulfate to poison the snails. This is a cheap and satisfactory method of destroying snails. In trials conducted at this Station powdered copper sulfate was mixed with land-plaster at the rate of one pound of bluestone to eight of land-plaster and this was broadcast on all wet areas where the snail in question occurred. Application of this mixture at the rate of about 270

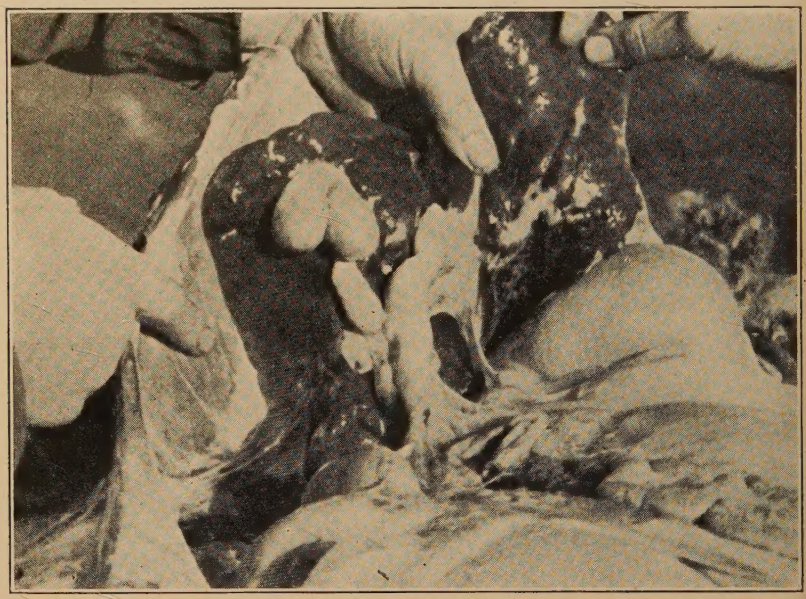

Fig. 13. Enlarged bile ducts filled with mature flukes; 179 flukes were taken from this liver. *Note.* Liver tissue is nearly back to normal.

pounds to the acre resulted in the destruction of from 95 to 99 percent of the snails present. Rather limited experiments in grazing sheep on pastures which had been treated at the rate of 540 pounds per acre, or twice the amount recommended, indicated that these animals will not be poisoned if left on such pastures following treatment.

These snails produce at least two broods a year, one in the spring and another in the fall. It seems advisable to treat pastures after the first warm spell in the spring has brought the snails out and before the first eggs are laid. Cost of treating pastures should not exceed five dollars per acre. The combination of regular treatment of all fluke-infested animals and destruction of snails by poisoning is not expensive. This method makes fluke control and eradication a practicable and profitable enterprise on Western Oregon ranches.